The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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The Reactions of the Hydrocarbons

EVERY chemist knows why paraffins were so-called. It seems from the achievements of petroleum chemists within recent years that this has been a complete misconception and that the paraffins in point of fact are highly reactive bodies, capable of infinite series of reactions when once the attack is made by the right methods. Much fundamental research is continuously undertaken by all the major oil concerns, both on technical problems and on the constitution of petroleum and its several fractions. Oil has, curiously enough, more "enemies" in the industrial world than most other fuels. Coal and oil seem incompatible and it is difficult to think of any fuel that is not considered by its producers to be a competitor of some form of oil. For straight heating problems, whether on land or sea, coal and oil are in competition. For the more refined domestic uses, whether for heat or light, gas and electricity compete with oil. Coal gas and electricity are endeavouring to displace diesel oil and petrol for motor traction and to a much greater extent in stationary engines. For driving lorries and buses, anthracite and low temperature coke are insistently knocking at the door, encouraged by the fact that oil has to be imported in times of emergency and by the tax upon imported oil. Coal is used as the direct raw material for the production of oils that, it is intended, shall displace petroleum and its products.

The outcome of this intense competition seems to have been that the oil companies have very wisely decided that it is their business to improve and still further improve the characteristics of the oil they produce so that it becomes increasingly difficult for competitors to offer a fuel equally good. The way to further utilisation of petroleum as a raw material for synthetic purposes is now being explored intensively, and although these researches will necessarily be difficult, the prospects of further developments in this great key industry appear to be illimitable. The production of valuable substances in bulk, such as iso-octane, is an example of what is now being done in the petroleum industry. Iso-butylene derived from cracking heavier fractions is absorbed in cold sulphuric acid yielding tertiary butyl alcohol; on warming, liquid di-isobutylene separates, and is subsequently hydrogenated to iso-octane.

The paper by Professor Ipatieff, which is reproduced on another page in our columns, shows in some detail one direction in which petroleum chemists are endeavouring to effect the synthesis of hydrocarbons with the object of producing, on a commercial scale, new substances of value from petroleum or its derivatives. Petroleum, in short, is becoming the basis of a huge chemical industry, aiming at the synthetic production of organic compounds. The traditional lack of reactivity of the paraffins is being overcome either by conversion of the paraffins into olefines or by reactions of paraffins with olefines. The "older" catalytic method, involving the polymerisation of the olefines, which are then hydrogenated to produce paraffins, is, actually, not many years old. Originally a thermal process was generally used, the oil being heated to 500 deg. C. under pressures ranging from 500 to 3,000 lb. per sq. in. An astonishingly varied range of compounds was produced, consisting of dimeride and trimeride olefines, and also of aromatics, naphthenes, and paraffins, and, if the conditions were very severe, large amounts of methane were also produced as the result of the decomposition which occured in addition to polymerisation. In the catalytic polymerisation process, the catalyst used is generally phosphoric acid in the form of acid phosphates; these are mechanically strong and can be regenerated when their activity diminishes, through contact with the oils treated and with the liquid and even the solid products of the reactions. With these catalysts it is only necessary to use pressures of the order of 150 to 300 lb. per sq. in. and temperatures of 150-250 deg. C. These conditions are mild enough to prevent the occurrence to any great extent of isomerisation reactions yielding non-olefinic liquid products.

The second primary method of synthesising hydrocarbons is the alkylation of paraffins with olefines, a reaction long held to be impracticable on account of the low reactivity of saturated aliphatic hydrocarbons. Professor Ipatieff's paper is primarily concerned with this type of reaction and he has a fascinating story to tell of the permutations and combinations of hydrocarbons derived from petroleum. It is only six years since this type of reaction was found possible, but the paper demonstrates clearly how great has been the progress during that short time. Petroleum chemists are making rapid progress and are meeting competition in the best possible way, by regarding their raw material as the basis of a great chemical industry. It is well that petroleum should so be regarded. It is evident that the quantity of petroleum present in the earth will be exhausted long before that of coal, and any attempt to do something more useful with it than burn it in a crude state, as in fuel oil, is heartily to be welcomed.

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NOTES AND COMMENTS

Science Students and the War

THE Ministry of Labour and National Service announces an extension of the terms of reference of the University Joint Recruiting Boards and their Technical Committees which interview men under the age of 25 with certain prescribed technical or scientific qualifications and make recommendations as to how such men can best be used. The extension of the terms of reference brings within the scope of this arrangement students in certain subjects of a technical or scientific nature at an earlier stage in their course than was previously the case and also students in certain additional subjects. The classes of men who may now be dealt with are the following: (1) Men with university degrees in engineering (including naval architecture) metallurgy, chemistry, physics, geology, the biological sciences (including agriculture) and mathematics (including statistics); (2) men with higher national diplomas or higher national certificates in mechanical or electrical engineering, or with the associateship of the Institute of Chemistry; (3) men who have completed to the satisfaction of the university at least one year's work of a course for a specialised honours degree in engineering (including naval architecture), metallurgy, chemistry, physics, applied mathematics, geology, and the biological sciences (including agriculture), and men who have started or are about to start their final year's study for a pass degree in engineering or metallurgy; (4) men who have started or are about to start their final year's study for the higher national diploma or higher national certificate in mechanical or electrical engineering or for the associateship of the Institute of Chemistry. Men under the age of 25 falling within any of the above classes may apply to a local office of the Ministry of Labour and National Service for forms of application and the address of the nearest Joint Recruiting Board.

Unfenced Machinery

THE recent Report of the Chief Inspector of Factories observes that " there has been a tendency to overlook the restricted scope of the Operations at Unfenced Machinery Regulations and to regard ' machinery attendants ' as being licensed to do work other than that prescribed; work which involves a contravention of the statute and would entail serious liability should an accident occur." The Regulations do not, as some people imagine, make it right for every kind of work to be carried out on unfenced moving machinery, provided that it is done by a certified person. Only certain work is permitted. To make the matter clearer the National Safety Frst Association has suggested the following test questions in regard to any proposed operation: (1) Is it an examination which *must* be carried out while the part is in motion? (2) Is it lubrication or adjustment, which (a) is shown by such examination to be *immediately necessary,* and (b) *must* be done while the part is in motion? (3) is it (a) lubrication of or shipping or mounting of belts on transmission machinery used in one of the fifteen processes scheduled in the Operations at Unfenced Machinery Regulations, and is it (b) work which *cannot* be deferred until the machinery is stopped? Unless one of these three questions can be answered unreservedly in the affirmative, the operation proposed is not legal.

Shortage of Chemicals in Japan

JAPAN has been relying to a large extent upon Germany for many essential chemicals, and is now facing a serious shortage; this accounts for Japan's strong reaction to Britain's two-way blockade which will prevent her from obtaining chemicals from Germany. The need for dyestuffs is particularly acute, Japan finding herself now very much in the position in which Britain was in 1914. Like other authoritarian states Japan has been trying to become self-sufficient and has paid large sums for foreign processes and patents. It is reported that Japan plans the exploitation of immense iron ore and coal deposits in Manchukuo, in the still wild and inaccessible Tungpientao district near the Korean boundary. Japanese efforts to buy the processes for du Pont synthetic rubber and German Buna rubber have failed. Du Pont's Nylon strikes directly at Japan's silk exports. All synthetic fibres in Japan are made from cellulose, obtained from a variety of sources, including beanstalks, mulberry leaves, bagasse and rice straw. Projects for the manufacture of cellulose from Burmese wild bamboo are being considered anew though previous attempts have proved uneconomical.

TWENTY YEARS AGO

IN view of the dislocation and bewilderment which has been created in various sections of industry by several of the Government's war-time measures, it is interesting, and perhaps of some consolation, to note that in 1919 similar confusion prevailed as a result of the Government's juggling with the cost of coal. THE CHEMICAL AGE, in its issue of November 29, 1919, made the following comment under the title " The Coal Conundrum ":—

" When speaking fairly hopefully last week of a reduction in the cost of coal, we certainly were not prepared for Sir Auckland Geddes' sudden change of front, which has resulted in a conditional drop of no less than 10s. per ton. In fact, it is difficult to keep pace with the calculations of the President of the Board of Trade, or to understand the basis of reckoning which called for a general 6s. advance in July, followed—early in November—by a protest that no reduction could be made, and culminating this week in a sensational somersault."

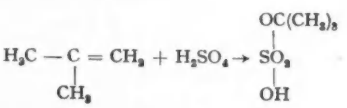
New Catalytic Synthesis of Hydrocarbons*—II

Different Types of Polymerisation

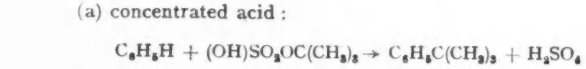
By
PROFESSOR V. N. IPATIEFF

(*Continued from page* 344, "*The Chemical Age*," *November* 18)

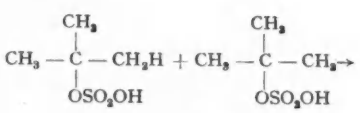
IN the presence of 96 per cent. acid, the principal reaction is that of alkylation accompanied by slight formation of ester. With 80 per cent. of acid, the principal reaction is that of polymerisation. Some ester is produced, but there is no alkylation. With 70 per cent. acid, isobutylene is converted into an ester without either polymerisation or alkylation. These results show that formation of ester is an intermediate phase in alkylation of benzine with olefine, as is the case in polymerisation of olefine:

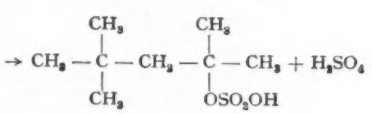


(a) concentrated acid:

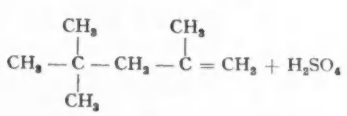


(b) weak acid:





or,



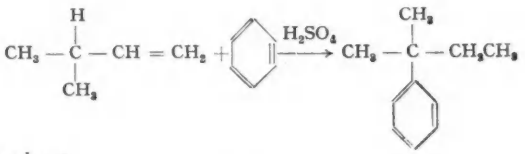
Varying Acid Concentrations

It follows that at 0 deg. C. 96 per cent. sulphuric acid catalyses alkylation of benzene by alkyl sulphate, more dilute acid causes the formation of the polymer of the same ester, and still more dilute acid has no catalytic action at all, so that the final product is ester. We have discovered similarly that phosphoric acid can be used as the direct alkylating catalyst of aromatic hydrocarbons.

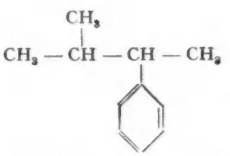
Alkylation of benzene, naphthalene and tetrahydronaphthalene with ethylene at 300 deg. C. has produced mono-, di- and polyethyled derivatives when carried out under pressure. In a similar way the propylation of naphthalene and fluorine at 200 deg. C. has produced respectively certain aromatic monopropyls. Invariably alkylation was accompanied by polymerisation of part of the propylene.

Examples of Isomerisation

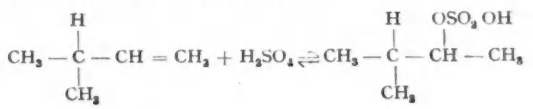
Although the use of sulphuric acid presents a practical method for the synthesis of alkylbenzenes, it must be used carefully, since the resulting product is not always what is expected, but may be an isomeric compound. For example, we have discovered quite recently that alkylation of benzene with isoproply-ethylene does not produce 2-methyl-3-phenyl-butane; instead, ter-amyl-benzene is obtained.

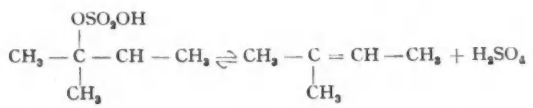


and not



The explanation is simple. Isomerisation of isopropyl-ethylene into trimethyl-ethylene is produced before alkylation. It is quite probable that the formation of ester is an intermediate phase in isomerisaion:

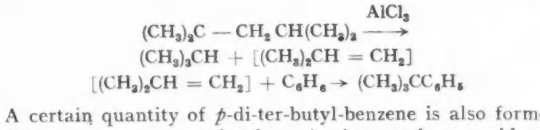




Other examples of isomerisation accompanying alkylation are actually being studied. Benzene can be similarly alkylated by naphthenes in the presence of sulphuric acid or aluminium chloride. Alkylation with cyclopropane is important, since the product of the reaction is *n*-propyl-benzene, rather than isopropyl-benzene, which is obtained when propylene or propylhaloid is employed as the alkylating agent. This reaction is used as a very practical method of synthesising *n*-propyl-benzene.

The reaction of cyclopentane with benzene, using aluminium chloride as the catalyst, produces cyclopentyl-benzene or amyl-benzenes. Aromatic hydrocarbons can be alkylated not only by olefines and naphthenes, but also by paraffins; it has been established that aluminium chloride, zirconium chloride, and phosphoric acid act as catalysts for these reactions. We have called these alkylations of aromatics by paraffins "destructive alkylation," because paraffin is divided into its lower homologue and a nascent olefine; the olefine reacts at once with the aromatic hydrocarbon to produce the alkylated compound.

For example, by agitating 2 : 2 : 4-trimethyl-pentane and benzene with aluminium chloride at 50 deg. C. for 3 to 4 hours isobutane and ter-butyl-benzene are chiefly obtained:



A certain quantity of *p*-di-ter-butyl-benzene is also formed.

There are two types of polymerisation catalysts; acids and haloid metallic salts. There are some differences in their action on olefines, but also many similarities. According to conditions, the reaction product may contain only olefines, or perhaps a compound mixture of olefines, paraffins, aromatics, and saturated and non-saturated cyclic hydrocarbons. It is

*Translated from *Chimie et Industrie*, Vol. 42, p. 215

by realising that all these reactions can and must take place in one of the two classes only that it is possible for us to understand the process of polymerisation and learn to direct the reaction so as to obtain the required product. We have called these classes " true polymerisation " and " joint polymerisation." When true polymerisation takes place, the product obtained is entirely olefinic and comprises di-mers, tri-mers, or higher poly-mers of the reacting body or a mixture of these bodies. When joint polymerisation occurs the product obtained is a mixture of paraffins: naphthenes, cyclo-olefines and aromatics; it contains a reacting body since it cannot contain a true polymer.

An example will make this differentiation clearer. If propylene is mixed with pure orthophosphoric acid under a working pressure of 51 atmospheres at a temperature of 204 deg. C., at such a speed that 50 per cent. of the olefine reacts, the resulting product is exclusively composed of polymers of propylene, especially nonylene and dodecylene.

If propylene is heated with orthophosphoric acid in an autoclave at 320 deg. C., and under a maximum pressure of about 100 atmospheres, the resulting liquid product has the following composition:

Composition.	%
Paraffins	15
Olefines	63
Cycloparaffins	10
Cyclo-olefines	6
Aromatics	6

The Nature of Polymerisation

In general, the factors determining the nature of the polymerisation which an olefine will undergo—true or joint polymerisation—are: temperature, pressure, and nature of catalyst, true polymerisation being favoured by lower temperature and pressures and less active catalysts (such as the more dilute acids). It is a quarter of a century since I first showed that ethylene polymerises by producing a mixture of olefines, paraffins, and naphthenes when under a high pressure and temperature of 350-400 deg. C. I also showed that catalysts such as aluminium, zinc chloride, and aluminium chloride considerably reduce the temperature necessary for polymerisation. At that time I did not attempt to explain the mechanism of the reaction, in the absence or presence of catalysts; I only made a few suggestions as to the possibility of converting ethylene into cyclohexane. These suggestions served as a basis for the first hypothesis which attempted to explain the working of the process of polymerisation. As can well be imagined, it was a great satisfaction to see how these first ideas were confirmed by our recent detailed examination of the subject, conducted at Riverside during the last five years.

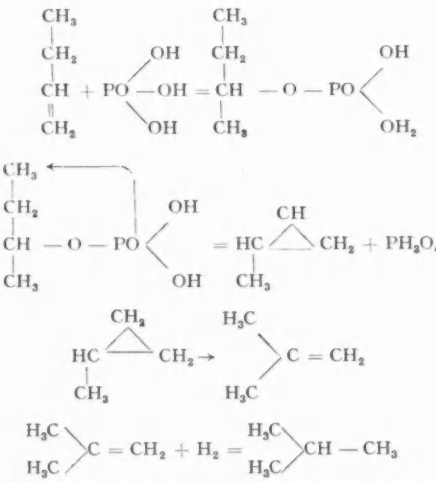
A few years ago I said that I believed that the polymerisation of ethylene or other olefines into substituted naphthene was analogous to the polymerisation of acetylenes which produced substituted benzene. I contended that higher olefines were formed either by direct polymerisation of ethylene, or by decomposition of naphthenes. In confirmation of this latter hypothesis, experiments showed that olefines were formed in the decomposition of cyclohexane. The formation of paraffinic hydrocarbons during polymerisation was allowed as providing either hydrogenation of olefines or naphthenes with rupture of the nucleus, or rupture of lateral naphthene side-chains.

Stages in the Process

By deeper study of the reaction of polymerisation in relation to catalytic alkylation I have collected all the data of the experiments. This tabulation has put me in a position to formulate a general hypothesis explaining these types of reaction; it has also allowed me to follow the whole working of the process of polymerisation more closely. Now, we can quite safely conclude that the first phase in the polymerisation of ethylene is the formation of long-chain olefines which can be isomerised into cyclohexane and other naphthenes. This isomerisation or cyclosation is actually an intramolecular alkylation. Alkylation of cyclohexane by ethylene produces mono- and polyethylated cyclohexane. Cycloparaffins can also lose hydrogen to form cyclo-olefines (in the presence of certain catalysts and even aromatics) or cyclic hydrocarbons with a double bond in the side-chain. It is the reaction of this hydrogen with olefines in an open chain that produces paraffins. On the other hand, hydrogenation of naphthenes can also cause the breaking of the ring with the formation of paraffins. Polycyclic naphthenes are probably formed by alkylation of cycloparaffins with non-saturated cyclic hydrocarbons or by intramolecular dehydrogenation of cycloparaffins.

Isobutane Production

It is interesting to note that true catalytic polymerisation of ethylene occurs in the presence of thorium chloride. A joint polymerisation in the presence of phosphoric acid produces a certain number of products, the most unexpected of which is isobutane. Its formation can easily be explained. The first product of the reaction must be *n*-butylene. This last is isomerised into isobutylene which produces isobutane by hydrogenation. The source of hydrogen is dehydrogenation of naphthenes formed by cyclisation of long-chain olefines.



The fact that butylene-1 actually produces isobutane under experimental conditions was shown by heating pure butylene-1 with phosphoric acid at 330 deg. C. in the presence of hydrogen. A liquid polymer is obtained, and a gas condensible at −78 degrees C. The composition of the gas was 50 per cent. isobutane, a small quantity of *n*-butane and *n*-butylene, which did not react. The quantity of isobutane formed represented 6 per cent. of the butylene that had reacted. Although joint polymerisation offers much interest and is important theoretically and practically, its use in the synthesis of hydrocarbons is limited by its nature, since it produces a complex mixture of compounds.

Acid and Haloid Salt Catalysts

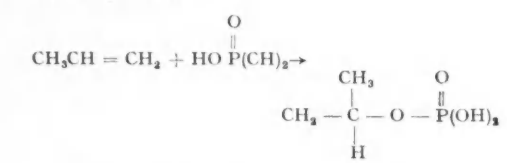
The acids whose catalytic action during true polymerisation of olefines has been shown are ortho- and pyrophosphoric acids, phosphorous acid, sulphuric acid, hydrogen chloride, perchloric acid, and chloracetic acid. The most important haloid salts which act as polymerising catalysts are aluminium chloride, zinc chloride, zirconium chloride, and boron fluoride.

As has been established, true polymerisation of ethylene in the presence of boron fluoride has been achieved. High temperatures and pressures produce joint polymerisation. Obviously less rigorous conditions produce true polymers. It has been established that the single product formed when ethylene is absorbed by phosphoric acid at 200 deg. C. is the monoethyl-ester of phosphoric acid. The latter is stable

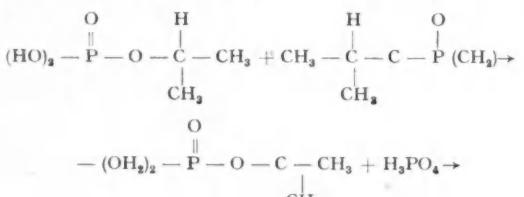
under the experimental conditions and does not produce polymerisation. At much higher temperatures (330 deg. C.), decomposition takes place, and the products of joint polymerisation are obtained.

Analogous experiments with propylene have shown that the isopropyl phosphate which is formed is not stable at relatively low temperatures (150 deg. C.) and decomposes with the formation of true polymers. Decomposition of the ester at a high temperature produces joint polymerisation.

Experiments on the polymerisation of isobutylene with perchloric acid have led to analogous and even more striking results. When the reaction product, obtained at room temperature, was heated, it decomposed and produced true polymers. Also, by cooling the product to −25 deg. C., a crystalline substance was obtained. These tests have enabled us to explain the mechanism of the reaction of polymerisation with phosphoric acid, just as with other acids. The first phase is the fixation of olefines on the acid with the formation of an ester:



Two molecules of the ester can then react to produce a dimer of the olefine with regeneration of phosphoric acid:



$$(CH_3)_2C = C(CH_3)_2 + 2H_3PO_4$$

The resulting polymer may comprise several isomers, since the hydrogenations thrown off by phosphoric acid radicals may arise from different carbon atoms. Of course, the reaction does not necessarily stop at the di-mer stage.

The hexyl-ester of phosphoric acid may react on isopropyl-phosphate to produce nonylene. In fact, experimental data show that the nonylene is the principal product and that hexylene is obtained in small quantity. It should be noted that pressure is very important in this operation, and influences the products to be obtained; the greater the increase in pressure, the greater the yield of hexylene, and the less that of nonylene.

Production of "Iso-octane"

Polymerisation of butylenes has been studied in great detail, particularly because the isomeric octylene obtained under certain conditions may be hydrogenated and produce octanes of high antidetonating power. By polymerising isobutylene in the presence of phosphoric acid at 30 deg. C., two compounds only are obtained: di-isobutylene and tri-isobutylene. In fact, at low temperatures, phosphoric acid makes an excellent catalyst for preparing di-isobutylene, and this reaction is recommended if large quantities of the di-mer are required; the yield of the di-mer is higher than when sulphuric acid or zinc chloride is used as a catalyst. The hydrogenation of di-isobutylene under pressure in presence of nickel oxide easily produces 2:2:4-trimethyl-pentane, usually called "iso-octane," the commercial importance of which is very great. At higher temperatures, the polymerisation product is a mixture of isomeric di-mers and tri-mers which are formed either by isomerisation of the olefine, or by removal of phosphoric acid elements to intermediate esters. Thus at 130 deg. C., the product contained about seven individual compounds, comprising three di-mers and four tri-mers. Polymerisation of *n*-butylene is analogous to that of isobutylene except that the minimum temperature of the reaction is slightly higher. At 130 deg. C., in the presence of phosphoric acid, a mixture of di-mers and tri-mers is obtained.

Cross-Polymerisation

A slightly different type of polymerisation is that which we have called "mixed polymerisation," or "cross-polymerisation." A "cross-polymer" is obtained when two olefines react together, for example "cross-polymerisation" of *n*-butylene with isobutylene and propylene with *n*- or iso-butylene. An interesting observation with this type of polymerisation was that which made it possible to polymerise certain olefines in conditions which are not rigorous enough to cause polymerisation of pure olefine. Thus, it was stated that propylene in the presence of butylenes begins to polymerise at a lower temperature than when it is alone. "Cross-polymerisation" of *n*-butylene and *n*-isobutylene produces 2:2:3-trimethyl-pentylene-3 and 2:2:3-trimethyl-pentylene-4. Other octylenes are also formed; their formation can easily be explained by the mechanism described above. "Cross-polymerisation" is obtained at a temperature of about 50 deg. below that at which pure *n*-butylene begins to polymerise. For example, it has been found that under similar conditions, in the presence of solid phosphoric acid as a catalyst, a temperature of 175 deg. C. was necessary for polymerising *n*-butylene, whilst "cross-polymerisation" occurred at 120 deg. C., and isobutylene polymerised at 90 deg. C.

Of course, other combinations of olefines can also be "cross-polymerised." When the product consists of a mixture of isomers, these latter can easily be separated by careful fractionation. When isomers have the same form and differ from each other only by the position of the double bond, hydrogenation of the mixture produces a single pure paraffin. In this way true or mixed catalytic polymerisation allows olefines and paraffins to be synthesised.

SOLID NAPHTHENIC ACIDS

In a letter published in *Nature* (Vol. 144, No. 3,654), Mr. Thomas Kennedy, of the Sunbury-on-Thames Research Station of the Anglo-Iranian Oil Co., Ltd., reports the isolation of a solid naphthenic acid from Iranian petroleum. During an investigation of the caustic washing liquors after use in removing traces of acid from a kerosene sulphur dioxide extract derived from Iranian petroleum, the presence of naphthenic acids in an oil from this source was proved for the first time. A subsequent investigation showed that naphthenic acids occurred in the kerosene sulphur dioxide extract to the extent of approximately 0.025 per cent. by weight, of which about 10 per cent. was removed by the light caustic washing. The spent caustic washing liquors after washing 2,000 gallons of kerosene sulphur dioxide extract were neutralised and the precipitated oil worked up in the usual manner into acidic, phenolic, mercaptan and hydrocarbon fractions. The acidic material was esterified three times by means of methyl alcohol and hydrochloric acid, whereby all the primary and secondary acids could be removed from the difficulty esterifiable tertiary acids. The residual tertiary acids, on standing for a few days, yielded a white crystalline solid which, after many crystallisations from low boiling petrol, had constant m.p. 82°. The anilide crystallised in colourless flat needles from aqueous methyl alcohol, m.p. 186-7°. By fractional crystallisation of the mother liquors a total yield of 3.3 per cent. of the acid was obtained on the original acid mixture from the caustic washing liquors. The acid proved to be saturated, and must therefore contain a closed carbon ring. The author publishes the results of his researches by permission of the chairman of the Anglo-Iranian Oil Co., Ltd.

Annual Meeting of B.A.C.

Timidity of Young Chemists Deprecated

A TENDENCY among young chemists to under-rate the commercial value of their abilities when applying for positions was the subject of comment at the twenty-second annual meeting of the British Association of Chemists held at the Café Royal, London, W.1, on November 25.

After several members had quoted instances where young chemists in applying for jobs had asked for salaries far below that which the employer expected to pay, Dr. J. Vargas Eyre, retiring president, who occupied the chair, observed that the chemist was a timid person, especially when he had just left college. He was inclined to ask for too little. He did not take into consideration the barren years when he was not earning anything and overlooked the three or four or even five years spent in preparing himself to render service. When an applicant asked for a small salary it was very difficult for an employer to pay more than was actually asked.

Mr. C. B. Woodley, general secretary, pointed out that although the Association attempted to safeguard the interests of chemists by keeping a close watch on salaries offered by employers their task was made difficult when chemists themselves asked for very low salaries.

Professor F. G. Donnan

The meeting, which was well attended, welcomed Professor F. G. Donnan, F.R.S., C.B.E., M.A., F.I.C., who has consented to serve as president of the Association in succession to Dr. Eyre.

The financial report was presented by the honorary treasurer, Mr. W. H. Woodcock. The report showed that in the income and expenditure account there was a balance of £3 14s. 3d. and in the unemployment benefit fund a reserve of £19,426 3s. 10d. There was a small total balance of £207 15s. 5d.

The annual report of the Council was presented by Mr. A. J. C. Cosbie, chairman. The report stated that on September 28 last a meeting of the executive was called at which it was decided to invite Council to delegate all its authority to an emergency council. Letters and telegrams were sent to each councillor and to chairmen of local sections asking for their approval. On receiving their replies, which were unanimous in approval, an emergency council was formed consisting of one member from each section and one member of the executive, with the general secretary. The functions of the Council were vested in this committee for the period of the international crisis.

All departments had been very active and the Association could again record a year of progress. The president, Dr. J. Vargas Eyre, M.A., F.I.C., had again devoted himself unsparingly to the interests of the B.A.C. during the past year. Members would be glad to learn that the Association had been honoured by Professor F. G. Donnan, who had agreed to accept office as president for the coming year. They looked forward to a year of considerable activity under his able guidance.

The total membership of the Association was now 2,030; 229 new members had been elected during the year. A number of members having obtained appointments outside the profession, and others having attained the rank of established Civil Servants, accounted for 31 resignations. Fourteen names where addresses could not be traced had been removed from the register. It was with regret that they had to record the decease of eight members, including such well-known personalities as Sir Robert Mond, and Messrs. W. E. Kay and A. W. Knapp, M.Sc., B.Sc., F.I.C., M.I.Chem.E.

The balance sheet and accounts recorded in figures their increasing and continued activity in all departments. Members were gradually realising the wisdom of building substantial funds for legal and special aid purposes. The increase in the allocation under the Unemployment Benefit Fund was accounted for by the cost of work in connection with the postal ballot and the registration of the rules. A higher allocation would be justified, but every effort had been made to keep the charge as low as possible, although the administrative work automatically increased with the growth of membership.

The new rules for the Unemployment Benefit Fund passed at the 21st annual meeting were subsequently confirmed by members voting in the postal ballot. The Association had no control over the time occupied in the legal requirements of registration, but it was satisfactory to record that after the requirements of the Registrar of Friendly Societies had been met, and the rules, with his amendments, had been reprinted and re-signed by the original signatories, they had received his Certificate of Registration.

The appointments service during the past year had provided members with greater opportunities than ever before, since the weekly circular had published over two thousand vacancies, many of which carried very satisfactory salaries.

So far as the legal aid service of the Association was concerned a very substantial number of agreements had been submitted for opinion during the past year. In addition several very difficult cases had been successfully concluded in the member's interest, by negotiation, without recourse to the Courts.

Mr. J. Bristowe P. Harrison, chairman of the Unemployment Special Purposes Committee reported that the committee had had another successful year. The fund was still expanding while claims continued on the low average of recent years.

The arrangements covering National Insurance provided for the individual to contract in and were therefore quite voluntary. Members would no doubt appreciate the value of taking this step, which provided for their benefit to be paid direct by the Association with a useful addition to the sum provided by the National Insurance Fund. Probationers and students who wish to contract in should apply to headquarters stating their wish to be enrolled as junior associates. The full benefits were available to those members who paid their subscriptions and insurance contributions promptly and without arrears. The committee recommended again that the additional benefit of 2s. 6d. per unit after five years' continuous subscribing membership, without arrears of subscription or contribution during this period, be continued. It further recommended that temporary sickness or personal accident during unemployment should not debar a member from receiving benefit, always provided that the committee was satisfied that the subscriber was otherwise eligible for benefit and subject to the usual conditions.

Indication of Virility

Mr. W. Littlejohn said the reports of the Association's activities were very satisfactory. It was pleasing to see that the membership was over 2,000 and had doubled itself in ten years. It was a very good indication of the virility of the Association.

The various reports were adopted and tributes to the officers and staff of the Association were paid by Mr. A. Churchman, chairman of the Birmingham section.

A proposal to safeguard the interests of the younger members of the Association who were called to the Colours was put forward by Mr. C. A. Wylie. He suggested that to avoid any hardships being caused such members should be treated as members in suspense and on return from active service should be immediately entitled to such benefits as they enjoyed prior to service on the resumption of payment of subscriptions. Mr. Wylie's proposal was adopted by the meeting.

MINISTRY OF SCIENCE?

Co-ordination Discussed by Association of Scientific Workers

A SCHEME for the co-ordination of science in war-time envisaged by the executive committee of the Association of Scientific Workers was discussed at length at the annual council meeting of the Association held at the National Trade Union Club, London, W.C.2, on November 25.

A memorandum showing the need for such national co-ordination and outlining a scheme by which it could be achieved was placed before the meeting by the executive committee. After commenting that scientific work carried out in Great Britain by a variety of institutions had developed in such a way that there was at present no single body which could co-ordinate the work done in these institutions and help them to supplement each other, the memorandum stated that the task of co-ordinating the country's scientific resources was a difficult one, but the matter was vital for the welfare of the community and all scientific organisations should unite to secure the most efficient utilisation of those resources. What appeared to be required was a body, armed with powers and resources resembling those of the state departments organising labour and supply, to ensure the pooling of knowledge and the rational allocation of scientific work. It should ensure adequate co-ordination between all units concerned, and the flow of discussion and free criticism essential for scientific progress, while maintaining adequate safeguards of secrecy.

To form a basis for discussion a tentative scheme was put forward in the memorandum embodying a new Government department for the co-ordination of science governed by a Secretary of State, a Director-General and an executive council.

During the discussion on the subject Dr. C. A. Wingfield, Aberdeen, said that the main object of the Association was to promote the interests of the scientific worker and the interests of science in society, but he questioned whether that could be done by trying to organise science from above, through the Government, rather than from below, by organised scientists themselves. He felt that the situation had changed recently and that they would have to have a very clear idea of the outcome of pressing the Government to establish a Ministry of Science. The members of the Aberdeen branch felt the need for some co-ordination of scientific effort, but were of the opinion that it must be by democratic organisation and that it would be best if they tried to set up some body independent of Government administration and consisting of scientific and technical men who would make recommendations regarding the proper utilisation of the scientific resources of the country.

Mr. J. V. Harding, supporting opposition to the scheme, said that a Ministry of Science if established could do much harm and could be used for bringing science, which had now the advantage of independence, under Government control.

Professor J. D. Bernal said that he would be loath to throw up the plans for a Ministry because it represented something that had great publicity value and gained support for their opposition to the stoppage of research and other matters of disorganisation. He maintained that efficient organisation had not been carried on at all well since the outbreak of war. The Central Register, which had a most restricted scope, seemed to have broken down. In many cases very few people had been taken into Government departments until the services of all the civil servants in those departments had been utilised. Dozens of eminent experts had not been called upon. The whole organisation of science had broken down under war conditions. The Association should be very concerned with the proper utilisation of scientific resources not only for immediate war needs but for "concealed" needs such as the psychological effect of the black-out, the alteration of food supplies and questions of health. To obtain such organisation, however, it was necessary to raise the status of science in this country. He thought it might be valuable for the Association to set up a body of scientists to collect information about what was happening and to suggest proper solutions for the attention of the Government.

Dr. L. Klatzow contended that a Ministry in itself was not a bad thing; it was the way in which it might be run that was bad. The Association should continue to urge the establishment of a Ministry for the Co-ordination of Science.

A resolution proposing that the Association should not press for a Ministry of Science in the present circumstances was put before the meeting and carried by 28 votes to 12 with a number of abstentions.

Several members emphasised that the primary purpose of the A.S.W. was to effect the organisation of scientists and not of science, since any satisfactory co-ordination of science depended upon an adequate organisation of scientists. A resolution to this effect was carried.

The report of the executive committee of the Association for the past year revealed that the membership had increased from 1,059 in 1938 to 1,327. The accounts showed a profit of £36. Income from subscriptions rose to £781 and the gross income totalled nearly £900.

The following officers were elected for the ensuing year:—President, Professor F. G. Donnan; hon. general secretary, Dr. W. A. Wooster; hon. treasurer, Dr. L. Klatzow; additions to vice-presidents, Professor P. M. S. Blackett and Professor D. Koilin; executive committee, Messrs. H. L. Cox, S. A. Gregory, D. McClean, W. J. Mitchell, Dr. N. F. M. Henry and Dr. C. Ockrent.

IGNITION OF METHANE

Mr. C. S. W. Grice, of the Safety in Mines Research Laboratories, Sheffield, in a lecture on "Some Facts about Firedamp," at the Wigan Mining College, said it had been thought that it would not be possible to start an inflammation of methane in the undercut of a coal-cutting machine by means of the sparks emitted from the contact of the picks with the hard rocks, but the requisite condition for the ignition of methane by a flame had been obtained in the course of experiments made at the Buxton research station. The mechanism of ignition was now understood as a result of these experiments. Attempts had been made by the use of carbon dioxide inhibitors to produce a non-combustible mixture of gases in the undercut, and experiments had shown that the required condition was obtained by discharging carbon dioxide from the machine into the undercut at the rate of 1.5 cubic feet per minute. Mr. Grice expressed the view that methane was a comparatively safe gas, but in practical coal mining there was always the danger that the requisite conditions for an explosion might be allowed to exist simultaneously.

COPPER SULPHATE AND CHROMIUM COMPOUNDS

The Board of Trade have made an Order—the Export of Goods (Prohibition) (No. 2) Order, 1939, Amendment (No. 12) Order, 1939—which came into force on November 27th with the following effect.

1. Sulphate of copper requires an export licence only when exported to countries in the European and Mediterranean areas.

2. Cattle and sheep dressings and dips do not require licences when exported to Empire countries.

3. Ships' chains and ships' cables, many chromium compounds and all paints containing chromium compounds require to be licensed for export to any destination.

PERSONAL NOTES

MR. KENNETH M. CHANCE has been re-elected president of the Institute of the Plastics Industry for the coming year.

* * * *

MR. L. F. WRIGHT, a blastfurnace technician, who is a director and works' manager of Messrs. Gjers Mills and Co., Ltd., Middlesbrough, has been elected president of the Cleveland Institution of Engineers. He succeeds Mr. A. Scholes.

* * * *

AFTER 40 years' service with Lever Bros., Ltd., and associated companies, MR. ROBERT FULTON has retired. Mr. Fulton was a director of William Gossage and Sons, Ltd., and also of Joseph Watson and Sons, Ltd., and Watson and Gossage, Ltd.

* * * *

MR. ARTHUR J. GILLIAN, general secretary of the Chemical Workers' Union is to be nominated Parliamentary and L.C.C. candidate in succession to the late Colonel Harry Day, Southwark (Central) Socialist representative. Under the Party truce he will probably be returned unopposed.

* * * *

IN VIEW OF the decontrol of the cooking fat and margarine industries, MR. J. P. VAN DEN BERGH, and MR. G. L. SALTON have resigned from the positions of Director of Margarine and Director of Cooking Fats Distribution respectively, the Ministry of Food announces. It is understood that both will continue to act as advisors.

SIR W. CLARE LEES, managing director of the Bleachers' Association, has been elected director of the Manchester Ship Canal Company.

* * * *

PROFESSOR J. A. GUNN, director of the Nuffield Institute for Medical Research, has been appointed chairman of the British Pharmacopœia Commission in the place of the late Dr. A. P. Beddard.

* * * *

IT IS announced that MR. J. N. DERBYSHIRE and MR. E. J. FOX, directors of the Stanton Ironworks Co., Ltd., have joined the board of Messrs. Stewarts and Lloyds, Ltd., tube manufacturers, Glasgow.

OBITUARY

MR. ARTHUR PINKERTON, F.C.S., of Holcombe Brook, near Bury, Lancs, who died recently, had for some years carried on business as a manufacturing chemist. During the last war he was chief chemist to the British and Foreign Supply Association, Ltd., and later became chief chemist and technical adviser to the Ministry of Munitions.

MR. D. W. T. CARGILL, of Lanark, who was a director of the Burmah Oil Company, Ltd. (and other companies) left personal estate to the total value of £1,287,074. His shares in the B. Oil Company are valued at £681,171.

General News——From Week to Week

EDIBLE OIL wholesale distributors held a meeting at Liverpool last Wednesday, to form an association covering the North-Western area. Forrest and Co. 8b Rumford Place, Liverpool, sponsored the calling of the meeting.

A 150-FT. CHIMNEY, 34 years old, one of the last remaining landmarks of the Marley Hill Chemical Works, Co. Durham, has been demolished. The chemical works were closed 21 months ago, when a modern plant was built by the owners at Monkton.

IT HAS BEEN decided to hold a special London meeting of the Chemical Engineering Group in the rooms of the Chemical Society, Burlington House, London, W.1, on Friday, December 8, at 2.15 p.m., when the chairman will initiate a discussion on "Factories and the Black-Out."

AN ORDINARY MEETING of the Institution of Chemical Engineers will be held on Tuesday, December 12, in the rooms of the Geological Society, Burlington House, Piccadilly, London, W.1, at 2.15 p.m., when a paper on Principles of Gas Compressor Design will be presented by Professor D. M. Newitt, M.C., D.Sc., Ph.D., A.R.C.S.

THE TREASURY have made an Order under Section 10 (5) of the Finance Act, 1926, as amended by Section 2 (1) of the Import Duties (Emergency Provisions) Act, 1939, exempting cyclo-hexylamine, meta-xylol, oxalic acid and aluminium chloride anhydrous from Key Industry Duty from November 15, 1939, until December 31, 1940. Copies of the Treasury Order, which is entitled "The Safeguarding of Industries (Exemption) (No. 5) Order, 1939," may be obtained from H.M. Stationery Office.

THE NUMBER of research students in the Colour Chemistry and Dyeing and Textile Industries Departments of Leeds University was extraordinarily large during the 1938-39 session according to a report issued by the advisory committee of the departments. A further increase in the number of new students for the Department of Colour Chemistry and Dyeing is forecast by the report, which states that the work done during the year by the Department included investigations into the single-bath process for dyeing wool with chrome mordant dyes, the electrical factors in the dyeing of cellulose with direct cotton dyes, and into problems connected with the dyeing of union materials.

THE NEXT MEETING of the Midlands Centre of the Electrodepositors' Technical Society will take place on Tuesday, December 5 at the James Watt Memorial Institute, Gt. Charles Street, Birmingham, 3, at 6.30 p.m. Mr. A. E. Nicol will present a paper on "Variables in Silver Cyanide Solutions," and Dr. H. Saengar will occupy the chair.

THE TREASURY have made an Order under Section 10(5) of the Finance Act, 1926, exempting phthalic anhydride from Key Industry duty from November 22 until December 31, 1939. Copies of the Treasury Order, which is entitled the Safeguarding of Industries (Exemption) No. 6 Order, 1939, may be obtained from H.M. Stationery Office.

A MOBILE TRANSPORTER capable of handling 40 tons of gypsum lumps and waste material in an hour has been manufactured for Cafferata and Co., Ltd., of Newark, by Messrs. Mavor and Coulson, Ltd., engineers Glasgow. The transporter, weighing 82 tons and measuring 100 feet, can be operated by three men, who are also responsible for the moving of the transporter as required. The machine is claimed to be the first of its kind made in Scotland.

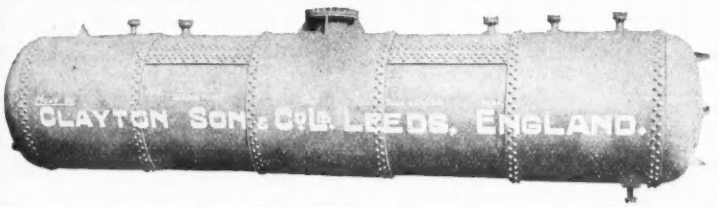
Foreign News

UNDER a Ministerial Resolution, dated October 9, the following goods are to be exported from Rumania, under export licences issued by the Local Price Committees on demand: medicines, chemical products, perfumes, and paints and varnishes.

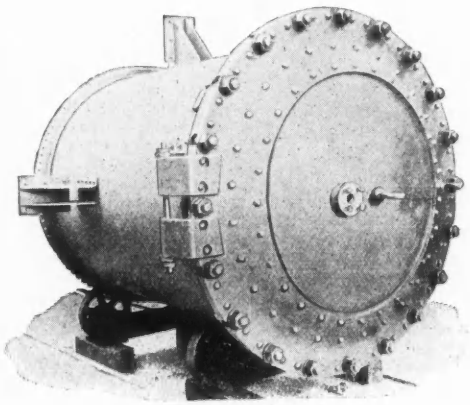
A NEW CO-OPERATIVE organisation, the Schweizerische Chemie-Syndikat (SCS) has been formed, with offices at Berne, under the terms of the decree of the Federal Council concerning the formation of war-time syndicates. The organisation will undertake all the tasks taken over by the Federal National Department of Economics connected with the import, export, storage, transport, distribution and use of products of the chemical industry. Every member of the co-operative must take up the number of shares of five hundred francs each fixed by the administrative council. The president of the management committee is Dr. A. Wilhelm, of Basle; the vice-president, Dr. W. Dürsteler, of Thalwil. Other members are E. Schenker of Basle, A. Fuchs of Basle, Dr. M. Nyffeler of Zurich, Th. Grauer of Horn, and M. Huber of Zurich. J. Schaffner of Born and Dr. H. Ringier, of Zofingen, are also shown as directors.

CLAYTON, SON & Co. Ltd. LEEDS

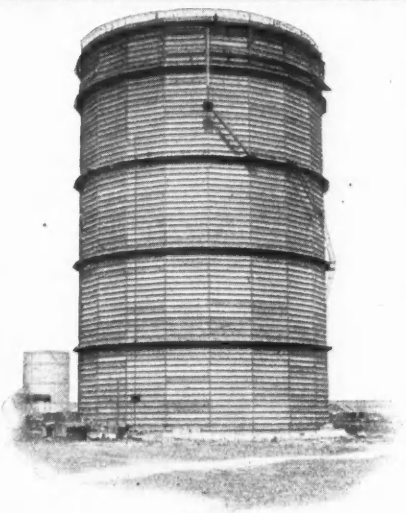
70 YEARS EXPERIENCE



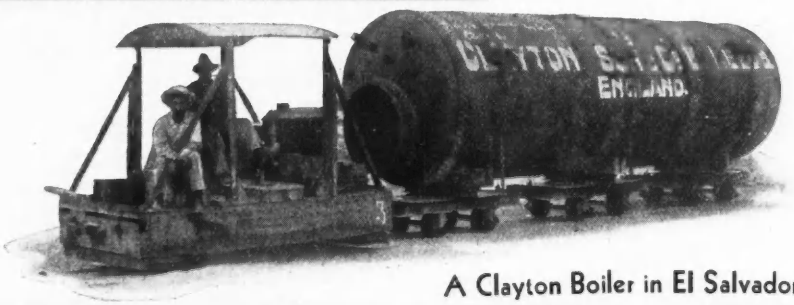
Riveted Steel Tanks for the Storage of Liquid Propane and Butane
31'·6" × 7'·0"
TEST PRESSURE : 568 lbs. per sq. in.



Boiling Kier.



Waterless Gasholders, Man. Type 2 Millions & 1 Million Capacity.



A Clayton Boiler in El Salvador.

CHEMICAL PLANT, PLATE WORK of EVERY DESCRIPTION
TANKS, OIL REFINING PLANT, STEAM BOILERS
GASHOLDERS, STILLS, WELDING SPECIALISTS

LONDON OFFICE, ABBEY HOUSE, 2, VICTORIA ST., S.W.1

Weekly Prices of British Chemical Products

ALL sections of the general chemical market have experienced a fair amount of activity during the past week and the movement of chemicals to the consuming industries has been quite substantial. In many directions dealers are finding it difficult to satisfy the market requirements the demand for such products as oxalic and tartaric acids, chromium oxide and barium chloride being greater than the available supply. There is a shortage of spot supplies of bichromate of potash and bichromate of soda both items being dearer by ¼d. per lb. and small parcels of yellow prussiate of potash are fetching exceedingly high prices. A good trade is being put through in formaldehyde and a fair interest is displayed in lithopone, lead oxides and white lead. The price position generally is steady with a decidedly firm undertone. Trade in coal tar products has followed a very even course and a fair amount of new business is reported. In addition, ex-contract deliveries have been maintained on a regular basis and quite substantial quantities have been involved. There is little change to report in the position of toluols and xylols.

MANCHESTER.—Firm price conditions still obtain throughout the Manchester chemical market and changes on balance for the week have been in an upward direction. A steady flow of contract delivery specifications, especially for textile bleaching and finishing purposes, has been reported, and users are awaiting new contract quotations. In the meantime, a fair volume of buying for prompt delivery where this is obtainable has been experienced. In the tar products market price uncertainty arising from control of some of the light descriptions has not yet been removed, and in some quarters it is stated that fresh business in the toluol and certain other materials is virtually at a standstill.

GLASGOW.—Business in the Scottish heavy chemical market is still conducted under difficulties owing to rapidly changing prices and control restrictions. Prices generally are still showing a tendency to rise chiefly owing to the uncertain position of shipping and freights. There is more inquiry for export, particularly in the case of materials previously supplied from Germany.

Price Changes

Rises: Citric Acid, Cresylic Acid, pale (Manchester), Lactic Acid, Potassium Dichromate, Tartaric Acid, Zinc Sulphate.

Falls: Salammoniac.

*In the case of certain products, here marked with an asterisk, the market is nominal, and the last ascertainable prices have been included.

†Benzol prices remain nominal, owing to doubts concerning the control position.

General Chemicals

ACETIC ACID.—Maximum prices per ton: 40% technical, 1 ton or over, £15 12s.; 10 cwt. and less than 1 ton, £16 12s.; 4 cwt. and less than 10 cwt., £17 12s.; 80% technical, 1 ton, £29 5s.; 10 cwt./1 ton, £30 5s.; 4/10 cwt., £31 5s.; 80% pure, 1 ton, £31 5s.; 10 cwt./1 ton, £32 5s.; 4/10 cwt., £33 5s.; commermercial glacial, 1 ton, £37; 10 cwt./1 ton £38; 4/10 cwt., £29; delivered buyers' premises in returnable barrels.

ACETONE.—Maximum prices per ton, 50 tons and over, £39; 10/50 tons, £39 10s.; 5/10 tons, £40; 1/5 tons, £40 10s.; single drums, £41 10s., delivered buyers' premises in returnable drums or other containers having a capacity of not less than 45 gallons each; delivered in containers of less than 45 gallons but not less than 10 gallons £10 10s. per ton in excess of maximum prices; delivered in containers less than 10 gallons each £10 10s. per ton in excess of maximum prices, plus a reasonable allowance.

*ALUM.—Loose lump, £8 7s. 6d. per ton d/d.

*ALUMINIUM SULPHATE.—£7 5s. 0d. per ton d/d Lancs.

AMMONIA, ANHYDROUS.—99.95%, 1s. to 2s. per lb. according to quantity in loaned cylinders, carriage paid; less for important contracts.

AMMONIUM CARBONATE.—£20 per ton d/d in 5 cwt. casks.

AMMONIUM CHLORIDE.—Grey galvanising £21 per ton, in casks, ex wharf. See also Salammoniac.

AMMONIUM DICHROMATE.—1s. per lb. d/d U.K.

*ANTIMONY OXIDE.—£68 per ton.

ARSENIC.—Prices nominal, f.o.b. Antwerp, subject to works acceptance.

BARIUM CHLORIDE.—90/100%, prime white crystals, £22 to £25 per ton.

BLEACHING POWDER.—Spot, 35/37% £9 5s. per ton in casks, special terms for contract.

BORAX COMMERCIAL.—Granulated, £18 per ton; crystal, £19; powdered, £19 10s.; extra finely powdered, £20 10s.; B.P. crystals, £27; powdered, £27 10s.; extra fine, £28 10s. per ton, in free 1-cwt. bags, carriage paid in Great Britain. Borax Glass, lump, £60; powder, £61; in tin-lined cases for home trade only, packages free, carriage paid in Great Britain.

BORIC ACID.—Commercial granulated, £32 per ton; crystal, £33; powdered, £34; extra finely powdered, £36; large flakes, £44 10s.; B.P. crystals, £41; powdered, £42; extra fine powdered, £44 per ton for ton lots, in free 1-cwt. bags, carriage paid in Great Britain.

CALCIUM BISULPHITE.—£7 10s. per ton f.o.r. London.

*CALCIUM CHLORIDE.—GLASGOW: 70/75% solid, £5 12s. 6d. per ton ex store.

CHARCOAL LUMP.—£7 5s. to £11 per ton, ex wharf. Granulated £7 to £9 per ton according to grade and locality.

*CHLORINE, LIQUID.—£18 15s. per ton, seller's tank wagons, carriage paid to buyer's sidings; £19 5s. per ton, d/d in 16/17 cwt. drums (3-drum lots); £19 10s. per ton d/d in 10-cwt. drums (4-drum lots); 4½d. per lb. d/d station in single 70-lb. cylinders.

CHROMETAN.—Crystals, 3⅜d. per lb.; liquor, £19 10s. per ton d/d station in drums.

CHROMIC ACID.—10¾d. per lb., less 2½%; d/d U.K.

CHROMIC OXIDE.—1s. 1d. per lb., d/d U.K.

CITRIC ACID.—1s. 1½d. per lb. MANCHESTER: 1s. 2½d.

COPPER SULPHATE.—MANCHESTER: £25 per ton f.o.b.

CREAM OF TARTAR.—100%, £5 2s. to £5 7s. per cwt., less 2½%.

FORMALDEHYDE.—40% by volume, £22 to £23 per ton, according to quantity, in casks, ex store.

FORMIC ACID.—85%, £42 per ton for ton lots, ex store, in cylinders; smaller parcels quoted at 45s. 6d. to 47s. 6d. per cwt., ex store.

GLYCERINE.—Chemically pure, double distilled, 1.260 s.g., in tins, £3 10s. to £4 10s. per cwt. according to quantity; in drums, £3 2s. 6d. to £3 16s. 0d. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

HEXAMINE.—Technical grade for commercial purposes, 1s. 4d. per lb.; free-running crystals are quoted at 1s. 7d. per lb.; carriage paid for bulk lots.

HYDROCHLORIC ACID.—Spot, 5s. 6d. to 8s. carboy d/d according to purity, strength and locality.

IODINE.—Resublimed B.P., 11s. 2d. per lb. in 7 lb. lots.

LACTIC ACID.—(Not less than ton lots). Dark tech., 50% by vol., £30 10s. per ton; 50% by weight, £35; 80% by weight, £60; pale tech., 50% by vol., £36; 50% by weight, £42; 80% by weight, £67. One ton lots ex works; barrels free.

LEAD ACETATE.—LONDON: White, £48 to £50, ton lots.

LEAD NITRATE.—About £40 per ton in casks.

LEAD, RED.—English, 5/10 cwt., £34 10s.; 10 cwt. to 1 ton, £34 5s.; 1/2 tons, £34; 2/5 tons, £33 10s.; 5/20 tons, £33; 20/100 tons, £32 10s.; over 100 tons, £32 per ton, less 2½ per cent. carriage paid; non-setting red lead, 10s. per ton dearer in each case; Continental material, £1 per ton cheaper.

LEAD, WHITE.—Dry English, less than 5 tons, £44 10s.; 5/15 tons, £40 10s.; 15/25 tons, £40; 25/50 tons, £39 10s.; 50/200 tons, £39 per ton, less 5% carriage paid; Continental material, £1 per ton cheaper. Ground in oil, English, 1/5 cwt., £52 10s.; 5/10 cwt., £51 10s.; 10 cwt to 1 ton, £51; 1/2 tons, £49 10s.; 2/5 tons, £48 10s.; 5/10 tons, £46 10s.; 10/15 tons, £45 10s.; 15/25 tons, £45; 25/50 tons, £44 10s.; 50/100 tons, £44 per ton, less 5% carriage paid. Continental material £2 per ton cheaper.

LITHARGE.—10 cwt.-1 ton, £34 15s. per ton.

MAGNESITE.—Calcined, in bags, ex works, about £9 to £10 per ton.

MAGNESIUM CHLORIDE.—Solid (ex wharf), £10 per ton

*MAGNESIUM SULPHATE.—Commercial, £5 10s. per ton, ex wharf

MERCURY PRODUCTS.—Controlled prices for 1 cwt. quantities: Bichloride powder, 6s. 4d.; bichloride (industrial users), 6s. 4d.; bichloride lump, 6s. 11d.; bichloride ammon. powder, 7s. 10d.; bichloride ammon. lump, 7s. 8d.; mercurous chloride, 7s. 8d. mercury oxide, red cryst., B.P., 9s.; red levig. B.P., 8s. 6d.; yellow levig. B.P., 8s. 4d.

*METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d more in all cases and the range of prices is according to quantities.

*NITRIC ACID.—Spot, £25 to £30 per ton, according to strength, quantity and destination.

OXALIC ACID.—£48 5s. per ton for ton lots, ex wharf, in casks, smaller parcels, 53s. to 57s. per cwt., ex store; deliveries slow.

*PARAFFIN WAX.—GLASGOW: 3¾d per lb

*POTASH, CAUSTIC.—Market nominal.

POTASSIUM CHLORATE.—Imported powder and crystals, ex store London, 10d. to 1s. per lb.

POTASSIUM DICHROMATE.—5¾d per lb. carriage paid. GLASGOW: 5¾d. per lb., carriage paid.

POTASSIUM IODIDE.—B.P., 9s. 10½d. per lb. in 7 lb. lots; for not less than 1 cwt., 7s. 9d. per lb.

POTASSIUM NITRATE.—Small granular crystals, £26 to £29 per ton ex store, according to quantity.

POTASSIUM PERMANGANATE.—B.P. 1s. 3½d. per lb.; commercial, 143s. per cwt., d/d.

POTASSIUM PRUSSIATE.—Yellow, market nominal, supplies scarce.
SALAMMONIAC.—Dog-tooth crystals, £40 per ton; medium, £38; fine white crystals, £16; in casks, ex store.
SALT CAKE.—Unground, spot, £3 15s. per ton.
SODA ASH.—Light 98/100%, £5 17s. 6d. per ton f.o.r. in bags.
SODA, CAUSTIC.—Solid, 76/77° spot, £13 10s. per ton d/d station.
SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.
SODIUM ACETATE.—£25 to £26 per ton, ex wharf.
SODIUM BICARBONATE.—About £10 10s. per ton, in bags.
SODIUM BISULPHITE POWDER.—60/62%. £12 10s. to £14 per ton d/d in 2-ton lots for home trade.
SODIUM CARBONATE MONOHYDRATE.—£20 per ton d/d in minimum ton lots in 2 cwt. free bags.
SODIUM CHLORATE.—£27 10s. to £32 per ton, d/d according to quantity.
SODIUM DICHROMATE.—Crystals cake and powder, 4¾d. per lb. net d/d U.K. with rebates for contracts. GLASGOW: 4¾d. per lb., carriage paid.
SODIUM HYPOSULPHITE.—Pea crystals, £15 15s. per ton for 2-ton lots; commercial, £11 15s. per ton. MANCHESTER: Commercial, £11 10s.; photographic, £16.
*SODIUM METASILICATE.—£14 5s. per ton, d/d U.K. in cwt. bags.
SODIUM NITRATE.—Refined, £8 5s. per ton for 6-ton lots d/d.
SODIUM NITRITE.—£18 5s. per ton for ton lots.
SODIUM PERBORATE.—10%, £4 per cwt. d/d in 1-cwt. drums.
SODIUM PHOSPHATE.—Di-sodium, £16 to £17 per ton delivered for ton lots. Tri-sodium, £18 per ton delivered per ton lots.
SODIUM PRUSSIATE.—4¼d. to 5¼d. per lb.
SODIUM SILICATE.—£8 2s. 6d. per ton.
*SODIUM SULPHATE (GLAUBER SALTS).—£3 per ton d/d.
*SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 to £3 10s. per ton d/d station in bulk. MANCHESTER: £3 15s.
SODIUM SULPHIDE.—Solid 60/62%, Spot, £11 15s. per ton d/d in drums; crystals, 30/32%, £9 per ton d/d in casks. MANCHESTER: Concentrated solid, 60/62%, £13; commercial, £9 10s.
*SODIUM SULPHITE.—Pea crystals, spot, £14 10s. per ton d/d station in kegs.
*SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.
SULPHURIC ACID.—168° Tw., £4 11s. to £5 1s. per ton; 140° Tw., arsenic-free, £3 to £3 10s.; 140° Tw., arsenious, £2 10s.
TARTARIC ACID.—1s. 2½d. per lb., less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 1s. 3½d. per lb.
ZINC OXIDE.—Maximum prices: White seal, £23 10s. per ton; red seal, £21 d/d; green seal, £22 10s. d/d buyers' premises.
ZINC SULPHATE.—Tech., £12 10s., carriage paid, casks free.

Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 9d. to 1s. 5d. per lb., according to quality. Crimson, 1s. 7½d. to 1s. 9½d. per lb.
ARSENIC SULPHIDE.—Yellow, 1s. 6d. to 1s. 8d. per lb.
CARBON DISULPHIDE.—£25 to £30 per ton, according to quantity, in free returnable drums.
CARBON TETRACHLORIDE.—£48 to £53 per ton, according to quantity, drums extra.
CHROMIUM OXIDE.—Green, 1s. 3d. per lb.
INDIA-RUBBER SUBSTITUTES.—White, 5¾d. to 6¾d. per lb.; dark 5¼d. to 6d. per lb.
LITHOPONE.—30%, £16 15s. per ton.
SULPHUR CHLORIDE.—6d. to 8d. per lb., according to quantity.
VEGETABLE BLACK.—£35 per ton upwards; 28/30%, £15 10s. 0d.; 60%, £29, delivered buyers' premises.
ZINC SULPHIDE.—£56 per ton ex works.
Plus 5% War Charge.

Nitrogen Fertilisers

AMMONIUM SULPHATE.—The following prices have been announced for neutral quality basis 20.6% nitrogen, in 6-ton lots delivered farmer's nearest station up to June 30, 1940; September, £7 5s.; October, £7 6s. 6d.; November, £7 8s.; December, £7 9s. 6d.; January, 1940; £7 11s., February £7 12s. 6d.; March/June, £7 14s.
CALCIUM CYANAMIDE.—The following prices are for delivery in 5-ton lots, carriage paid to any railway station in Great Britain up to June 30, 1940; September £8 2s. 6d.; October £8 3s. 9d.; November £8 5s.; December, £8 6s. 3d.; January, 1940, £8 7s. 6d.; February £8 8s. 9d.; March £8 10s.; April/June, £8 11s. 3d.
NITRO-CHALK.—£7 10s. 6d. per ton up to June 30, 1940.
SODIUM NITRATE.—£8 5s. per ton for delivery up to June 30, 1940.
CONCENTRATED COMPLETE FERTILISERS.—£11 4s. to £11 13s. per ton in 6-ton lots to farmer's nearest station.
AMMONIUM PHOSPHATE FERTILISERS.—£10 19s. 6d. to £14 16s. 6d. per ton in 6-ton lots to farmer's nearest station.

Coal Tar Products

†BENZOL.—At works, crude, about 1s. 0¾d. per gal.; 90's, 1s. 7d. to 1s. 9d.; pure, 1s. 10d. to 2s. MANCHESTER: Crude, 1s. 0½d. per gal.; pure, 1s. 10½d. per gal.
CARBOLIC ACID.—Crystals, 8½d. to 9d. per lb.; Crude, 60's, 2s. 6d. to 2s. 9d. according to specification. MANCHESTER: Crystals, 8¼d. to 9¼d. per lb., d/d; crude, 2s. 9d. to 3s. naked, at works.
CREOSOTE.—Home trade, 5¼d. per gal., f.o.r., makers' works; exports 6d. to 6¼d. per gal., according to grade. MANCHESTER: 4¼d. to 6d.
CRESYLIC ACID.—99/100%, 2s. 9d. to 3s. 3d. per gal., according to specification. MANCHESTER: Pale, 99/100%, 3s.
NAPHTHA.—Solvent, 90/160°, 1s. 7d. to 1s. 8d. per gal.; solvent, 95/160°, 1s. 10d. to 1s. 11d., naked at works; heavy, 90/190°, 1s. 2½d. to 1s. 4d. per gal., naked at works, according to quantity. MANCHESTER: 90/160°, 1s. 6d. to 1s. 8d. per gal.
NAPHTHALENE.—Crude, whizzed or hot pressed, £8 15s. to £10 15s. per ton; purified crystals, £15 per ton in 2-cwt. bags. LONDON: Fire lighter quality, £3 to £4 10s. per ton. MANCHESTER: Refined, £17 to £18.
PITCH.—Medium, soft, 32s. 6d. per ton, f.o.b. MANCHESTER: 35s. f.o.b. East Coast.
PYRIDINE.—90/140°, 17s. to 18s. 6d. per gal.; 90/160°, 14s. to 15s.; 90/180°, 3s. to 4s. 6d. per gal., f.o.b. MANCHESTER: 14s. to 17s. 6d. per gal.
TOLUOL.—90%, 2s. 3d. per gal.; pure, 2s. 5d. to 2s. 7d., nominal. MANCHESTER: Pure, 2s. 7d. per gal., naked.
XYLOL.—Commercial, 2s. 4d. per gal.; pure, 2s. 6d. MANCHESTER: 2s. 6d. per gal.

Wood Distillation Products

CALCIUM ACETATE.—Brown, £7 5s. to £8 per ton; grey, £10 to £12. MANCHESTER: Grey, £14.
METHYL ACETONE.—40.50%, £35 to £38 per ton.
WOOD CREOSOTE.—Unrefined, 1s. to 1s. 3d. per gal., according to boiling range.
WOOD NAPHTHA, MISCIBLE.—3s. 7d. to 4s. per gal.; solvent, 4s. to 4s. 6d. per gal.
WOOD TAR.—£4 to £5 per ton, according to quality.

Intermediates and Dyes

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.
ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.
BENZALDEHYDE.—1s. 10d. per lb., for cwt. lots, net packages.
BENZIDINE, HCl.—2s. 7d. per lb., 100% as base, in casks.
BENZOIC ACID, 1914 B.P. (ex toluol).—1s. 11d. per lb. d/d buyer's works.
m-CRESOL 98/100%.—1s. 8d. to 1s. 9d. per lb. in ton lots.
o-CRESOL 30/31° C.—6½d. to 7½d. per lb. in 1-ton lots.
p-CRESOL 34/35° C.— 1s. 7d. to 1s. 8d per lb. in ton lots.
DICHLORANILINE.—2s. 1½d. to 2s. 7d. per lb.
DIMETHYLANILINE.—Spot, 1s. 7½d. per lb., package extra.
DINITROBENZENE.—8d. per lb.
DINITROCHLORBENZENE, SOLID.—£79 5s. per ton.
DINITROTOLUENE.—48/50° C., 9d. per lb.; 66/68° C., 11½d.
DIPHENYLAMINE.—Spot, 2s. 3d. per lb.; d/d buyer's works.
GAMMA ACID, Spot, 4s. 4½d. per lb. 100%, d/d buyer's works.
H ACID.—Spot, 2s. 7d. per lb.; 100%, d/d buyer's works.
NAPHTHIONIC ACID.—1s. 10d. per lb.
β-NAPHTHOL.—£97 per ton; flake, £94 8s. per ton.
α-NAPHTHYLAMINE.—Lumps, 1s. 1d. per lb.
β-NAPHTHYLAMINE.—Spot, 3s. per lb.; d/d buyer's works.
NEVILLE AND WINTHER'S ACID.—Spot, 3s. 3½d. per lb. 100%.
o-NITRANILINE.—4s. 3½d. per lb.
m-NITRANILINE.—Spot, 2s. 10d. per lb. d/d buyer's works.
p-NITRANILINE.—Spot, 1s. 10d. to 2s. per lb. d/d buyer's works.
NITROBENZENE.—Spot, 4½d. to 5½d. per lb., in 90-gal. drums, drums extra, 1-ton lots d/d buyer's works.
NITRONAPHTHALENE.—10d. per lb.; P.G., 1s. 0½d. per lb.
SODIUM NAPHTHIONATE.—Spot, 1s. 11d. per lb.; 100% d/d buyer's works.
SULPHANILIC ACID.—Spot, 8¾d. per lb. 100%, d/d buyer's works.
o-TOLUIDINE.—11d. per lb., in 8/10 cwt. drums, drums extra.
p-TOLUIDINE.—2s. per lb., in casks.
m-XYLIDINE ACETATE.—4s. 5d. per lb., 100%.

Latest Oil Prices

LONDON, Nov. 29.—To December 31 (per ton, net, naked, ex mill, works or refinery, and subject to additional charges according to package and location of supplies):—LINSEED OIL, raw, £36 10s. RAPESEED OIL, crude, £44 5s. COTTONSEED OIL, crude, £26; washed, £28 15s.; refined edible, £29 12s. 6d.; refined deodorised, £30 10s. SOYA BEAN OIL, crude, £27; refined deodorised, £31. COCONUT OIL, crude, £22 2s. 6d.; refined deodorised, £25 7s. 6d. PALM KERNEL OIL, crude, £21 10s.; refined deodorised, £24 15s. PALM OIL, refined deodorised, £27. GROUNDNUT OIL, crude, £29 10s.; refined deodorised, £34. WHALE OIL, crude hardened, 42 deg., £24 10s. refined hardened 42 deg., £27. ACID OILS.—Groundnut, £20; soya bean, £18; coconut and palm kernel, £18 10s. Non-controlled commodities were in very poor request and values were about unaltered. ROSIN, 25s. to 35s. per cwt. according to grade. TURPENTINE, 60s. 6d. per cwt., spot, American, ex wharf, including tax, barrels, and ex discount.

Commercial Intelligence

The following are taken from printed reports. but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

JUSTRITE MANUFACTURING CO., LTD., Reading, ink manufacturers. (M., 2/12/39.) November 20, £400 debenture, to W. H. Lawrence, Windsor, general charge.

L. LIGHT AND CO., LTD., London, S.W., chemical manufacturers. (M., 2/12/39.) November 15, series of £500 debentures, present issue £250; general charge. *£400. April 8, 1938.

MENDLE BROTHERS, LTD., Treforest, manufacturers and dealers of horn, bone, resin, etc (M., 2/12/39.) November 21, £500 debenture, to B. H. Ries, London; general charge.

Satisfactions

BRITISH COLOUR AND MINING, LTD., Manchester. (M.S., 2/12/39.) Satisfaction November 16, £2,000 registered December 6, 1927.

County Court Judgment

DIAMOND AND HOLDING, LTD. (C.C., 2/12/39.) R.O. 177 Regent Street, W.1, manufacturing chemists. £25 12s. 3d. October 25.

Companies Winding-Up Voluntarily

THE OLD STRAND CHEMICAL AND DRUG CO., LTD. (C.W.U.V., 2/12/39.) Mr. Percy Richards, 24 Coleman Street, E.C.2, liquidator.

MULTI-COLOR DYERS (1920), LTD. (C.W.U.V., 2/12/39.) Meetings of members and creditors at the offices of the liquidator, Martins Bank Chambers, Nelson, on Thursday, December 28. T. M. Threlfall, liquidator.

THE MIDLAND REFRACTORIES CO., LTD. (C.W.U.V., 2/12/39.) General meeting of members at the offices of General Refractories, Ltd., Genefax House, Sheffield, 10, on December 30, at 11.15 a.m. L. J. Rowley, Genefax House, Sheffield, 10, liquidator.

THE GUISELEY SILICA CO., LTD. (C.W.U.V., 2/12/39.) General meeting of members at the offices of General Refractories Ltd., Genefax House, Sheffield, 10, on December 30, at 11 a.m. L. J. Rowley, Genefax House, Sheffield, 10, liquidator.

SOUTH WALES REFRACTORIES, LTD. (C.W.U.V., 2/12/39.) General meeting of members at the offices of General Refractories, Ltd., Genefax House, Sheffield, 10, on December 30, at 11.30 a.m. L. J. Rowley, Genefax House, Sheffield, 10, liquidator.

Company News

The Anchor Chemical Co. have announced payment of half-year's preference dividend to November 30, 1939.

The Eastern Chemical Co., Ltd., report a profit for the year ending March 31 of £2,468 (£317) which reduces the debit to £49,357.

The United Molasses Co., Ltd., have declared a second interim dividend of 15 per cent. actual, less income tax, on the ordinary stock, payable on December 29, 1939.

At the annual ordinary general meeting of **British Industrial Plastics, Ltd.,** held on November 22, a highly satisfactory position was disclosed. On the issued capital of £442,851 the trading profit amounted to £110,630, and the net profit £22,204. With the £5,697 brought forward from last year, available profits amounted to £28,101, out of which the preference dividend for the year absorbs £1,482, a dividend of 8 per cent. less tax on the ordinary shares accounts for £22,258, while the agreed percentage on dividends payable to directors amounts to £445. A sum of £3,917 is thus left to be carried forward. In consequence of the outbreak of war a flood of orders had been received from abroad for moulding powders with the result that one of the company's works was operating for 168 hours per week, while at another two new moulding powders were under test. The company had been fortunate in securing ample supplies of wood pulp and wood meal, and supplies of other important raw materials were assured.

New Companies Registered

Fire and First Aid, Ltd. (357,556).—Private company. Capital: £1,500 in 1,500 shares of £1 each. To carry on the business of manufacturers of and dealers in appliances, machinery, apparatus, supplies, materials, antidotes, fittings and accessories of all kinds for use in or connected with fire extinction, prevention and protection, air raid precautions and gas protection, including gas decontaminating appliances and supplies, masks, respirators, goggles, blinds, curtains, screens, filters and all other supplies, manufacturers of and dealers in surgical and first-aid equipment, chemicals, etc. Directors: Norman C. Brown, 25 Harcourt Lodge, Croydon Road, Wallington, Surrey; Frank W. Veysey.

Chemical and Allied Stocks and Shares

ALTHOUGH there was no improvement of activity in the stock and share markets, industrial and kindred shares were fairly well maintained in price. Sentiment has again benefited from the fact that recent dividend announcements have been up to best market estimates, while the view is gaining ground that in some directions the Excess Profits Tax is unlikely to bear as heavily on future results as had been assumed in some quarters of the market.

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Small fluctuations were shown in Imperial Chemical Ordinary, which, however, were better on balance at 31s. 1½d., compared with 30s. 4½d. a week ago, while the preference units were well maintained at 31s. Fison, Packard had rather a more active appearance, but were lower at 36s. 4½d., while B. Laporte, which continued to be held firmly and were inactive, were again quoted around 57s. 6d. Lever and Unilever at 30s. 7½d. were little changed, but the 7 per cent. and 8 per cent. preference units were a few pence down, due to deduction of half-yearly dividends from prices. John Knight preferred ordinary were 1s. 3d. better at 77s. 6d., while British Oil and Cake Mills preferred ordinary remained at 37s. 6d. Shares of companies associated with the plastics industry were less active, but Erinoid continued to attract rather more attention at around 3s. Tube Investments were higher at 85s., aided by the good impression created by the annual results, but the majority of iron, steel and allied securities were dull and showed only moderate movements. Elsewhere Ruston and Hornsby were better at 27s., while R. A. Lister and International Combustion shares had a firm appearance on expectations that the forthcoming results will disclose good figures. United Molasses were firm around 25s. 6d. on the further dividend payment and the statements in the directors' announcement. Turner and Newall had a steady appearance at 73s. awaiting declaration of the final dividend. Less attention was given to rayon and other textile securities, although there are continued expectations that the impending British Celanese results will bear out market anticipations of encouraging improvement in profits. Courtaulds have not kept best prices touched during the past few days, but at 33s. 10½d. were higher on balance, sentiment having continued to be influenced by the new product recently announced by the Viscose Corporation, the company's American associate. Steady features were again provided by British Match at 32s. 9d. and by Imperial Smelting at 10s. 9d., while Wall Paper deferred have been marked up sharply to 20s. 7½d., following the recent fall which resulted from the dividend announcement. British Aluminium fluctuated, but at 51s. 3d. were little changed as compared with a week ago.

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Associated Cement and other cement shares were little changed, and British Plaster Board were around 26s. British Tyre and Rubber were firm at the higher price of 33s., in view of the raising of the distribution from 10 per cent. to 11 per cent., while Dunlop Rubber fluctuated around 27s. 6d. Triplex Glass were lowered to 18s. 9d., in view of the growing assumption that reduction of activity in the motor car trade will affect demand for safety glass. United Glass Bottle, Canning Town Glass and other shares of glass producers were steady but inactive. In other directions Boots Drug were around 40s. 3d., Sangers 20s. 3d. and Timothy Whites 22s. 6d., while Beechams Pills deferred remained active around 8s. 3d., on hopes that the interim dividend may be maintained. There was little activity in paint manufacturers' shares, and Pinchin Johnson were again 20s. 6d. Monsanto Chemicals 5½ per cent. preference shares transferred around 21s.

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Among oil shares Trinidad Leaseholds declined from 83s. 1½d. to 77s. 6d., but Anglo-Iranian were maintained at 61s. 3d. Lobitos held most of their recent rise, and Burmah Oil were little changed on balance.